Attachment 4. Project Description

Statement of Purpose

Diablo Water District (District) seeks funding through DWR's 2011-2012 DWR Local Groundwater Assistance grant program to 1) improve characterization of hydrogeologic conditions and 2) expand a monitoring program both of which will directly serve groundwater management activities in East Contra Costa County. The project work will include test hole drilling, collection of geophysical and geological data, installation of permanent monitoring wells, and collection of water quality and water level data.

The end result of the proposed work will be twofold. First, it will enable the District to address factors that currently, and may in the future, affect a conjunctive use program initiated in 2006 for its municipal water system. Second, it will help preserve the safety and reliability of sources of supply for other small water systems within its sphere of influence. The project work is consistent with, and directly serves, objectives of the District's Groundwater Management Plan adopted in 2007. It is also consistent with the District's participation on an Integrated Regional Water Master Plan Update, authorized under the 2010 Proposition 84 Integrated Regional Water Management Planning Grant, Round 1 (**Appendix 4-1**), awarded to Contra Costa Water District (**Appendix 4-2**).

The proposed work will improve characterization of the aquifer system tapped for both large-scale municipal use and smaller community water systems, helping to eliminate data gaps that currently exist in key areas. These data gaps potentially limit conjunctive use of groundwater as initiated by the District in 2006 and pose problems for various local communities that rely on groundwater from small water systems. The potential limits on conjunctive use include hardness, which poses consumer acceptance concerns, and salinity, which affects discharge quality at the local wastewater treatment facility. For many small communities, including a Disadvantaged Community for which the District operates a small water system, groundwater use is impacted by the presence of arsenic, manganese, and iron near or exceeding the state drinking water maximum contaminant limit. These small systems cannot adequately investigate or fund engineering and construction costs to implement treatment or other solutions without assistance.

The expanded characterization and monitoring network under the proposed work plan will ultimately address deficiencies that are currently obstacles in determining sustainable yield of local groundwater resources. The new information will be used by the District and others to quantify sustainable yield, a stated objective in the District's 2007 Groundwater Management Plan.

Diablo Water District Background

Originally formed in 1953 as the Oakley County Water District, the District changed its name to Diablo Water District in 1993. The District is located south of the San Joaquin River Delta,

midway between San Francisco and Sacramento in eastern Contra Costa County (**Figure 4-1**). **Figure 4-1** also shows the area of the Tracy Groundwater Subbasin (5-22.15), which is the source of groundwater used by the District and others in the East Contra Costa region.

The mission of Diablo Water District is to provide a safe, dependable, and adequate supply of high quality potable water to meet the requirements of the residents and businesses in our service area. The District provides service to approximately 36,000 residents in the City of Oakley, including the East Cypress Corridor area, the Town of Knightsen, and some or possibly all of Bethel Island for those residents whom wish to secure water service from the District (UWMP, 2010). The District's Sphere of Influence and Bethel Island encompass approximately 19,000 acres and the District currently serves about half of this area, while the remainder is undeveloped or in the process of developing. The existing treated water system is located in the western part of the District's Sphere of Influence with significant future development planned for the eastern part of this area. The District's treated water system will be expanded to serve the eastern area. The District's service area is shown in **Figure 4-2**.

Diablo Water District's water system consists of approximately 10,400 metered connections (UWMP, 2010), transmission and distribution pipelines, three water storage reservoirs (2.5, 5, and 5 million gallons) built in 1986, 1990, and 2009, respectively, two supply wells (Glen Park and Stonecreek), pumping facilities, and a water treatment facility. The Randall-Bold Water Treatment Plant (RBWTP), owned jointly by the District (37.5 percent) and Contra Costa Water District (62.5 percent), began service in 1992. Diablo Water District has maximum treatment plant capacity allocation from the RBWTP of 15 million gallons per day (mgd) with a future maximum allocation of 30 mgd.

The District receives untreated Contra Costa Water District (CCWD) water through an agreement with CCWD. While the District does not have a written quantity guarantee of supply from CCWD, it may draw up to 30 mgd from the RBWTP during normal years to meet maximum daily water demands within its system. CCWD has a full commitment from the Central Valley Project of 195,000 acre-feet per year and provides water to central and eastern Contra Costa County via the Contra Costa Canal.

In addition to surface water from CCWD, the District utilizes groundwater from the Glen Park Well, placed into service in August 2006, and the Stonecreek Well, on-line in June 2011. The percentage of water used from each source varies as a function of a blending strategy designed to provide uniform quality throughout the service area in order to comply with a limit on total hardness. The District also operates and/or owns several wells that serve small community water systems as regulated by Contra Costa County Environmental Health Division.

Regional Water Resource Planning

The District participates in a variety of regional water management activities. The District is one of eleven public agencies that comprise the East County Water Management Association (ECWMA), which includes water purveyors in the eastern portion of Contra Costa County. The

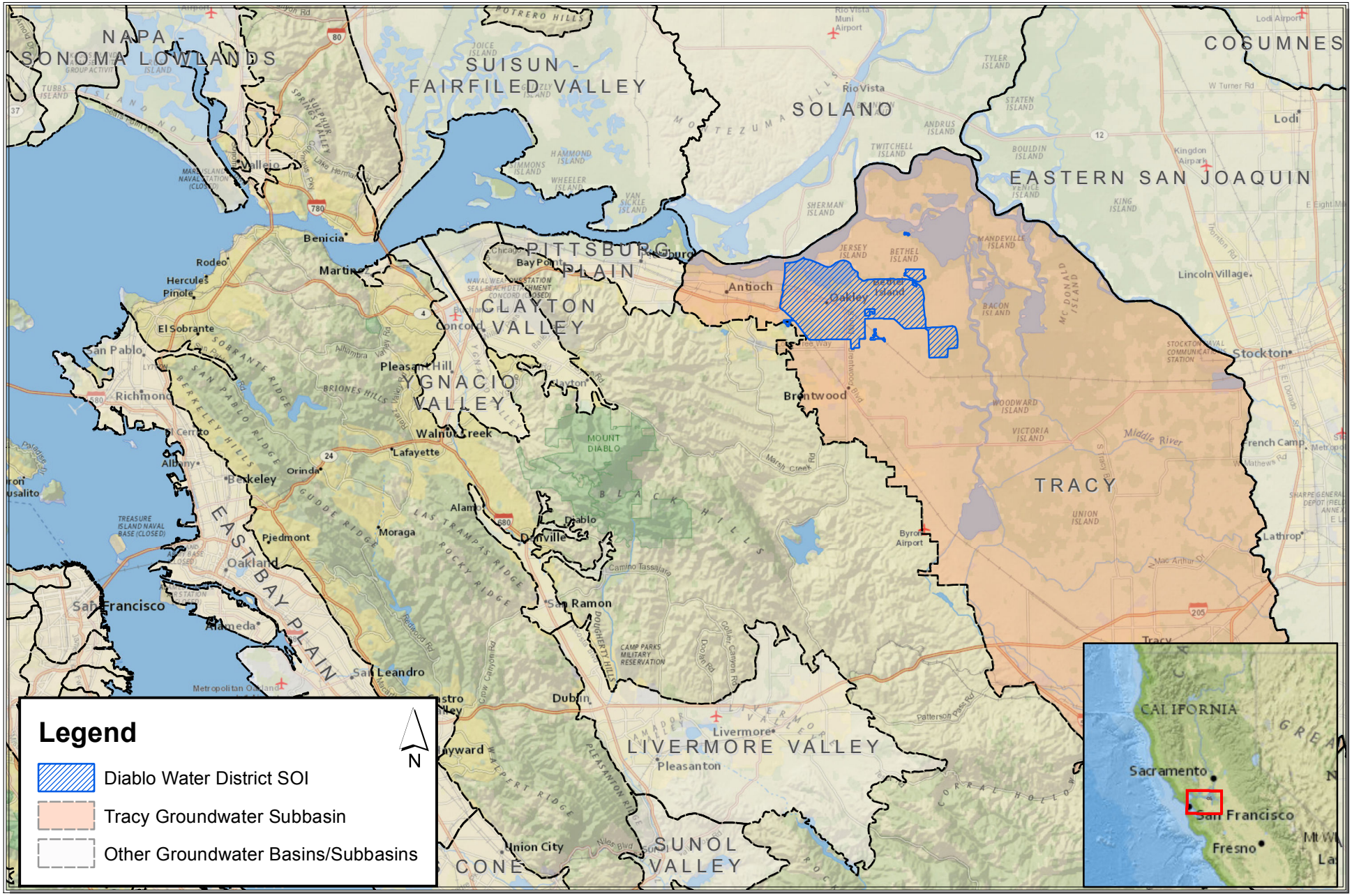

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Figure 4-1
Location Map
Diablo Water District

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Figure 4-2
District Service Area and Existing Facilities

ECWMA was formed in 1995 to identify and evaluate potential water management strategies to meet future water needs in the area. In addition to the Diablo Water District, the member agencies include: City of Antioch, City of Brentwood, City of Pittsburg, Byron-Bethany Irrigation District, Town of Discovery Bay, Contra Costa County Water Agency, CCWD, Delta Diablo Sanitation District, East Contra Costa Irrigation District, and Ironhouse Sanitary District. Most notably, the ECWMA member agencies participated in the preparation of the East County Functionally Equivalent Regional Water Management Plan completed in July 2005, and is currently preparing a complete Integrated Regional Water Management Plan Update for the region under the Prop 84 Integrated Regional Water Management Planning Grant cited above.

In 2007, the District adopted a Groundwater Management Plan (GWMP), which includes the collection of groundwater data and sharing it among other groundwater-using entities in the region, including the Town of Discovery Bay, East Contra Costa Irrigation District, and the City of Brentwood. The data is presented in periodic reports which summarize the monitoring data, present an analysis of trends, and describe the status of management actions performed and/or recommended. This information is also made available to the public through the District's website.

Conjunctive Use and Diablo Water District's Well Utilization Project

Prior to 2001, the Diablo Water District pumped a limited quantity of groundwater from its Corporation Yard Well. However, due to poor groundwater quality, the facility is now a standby source for emergency service (UWMP, 2010). In 2004, the District initiated a feasibility study for a conjunctive use project known as the Well Utilization Project (CDM, 2004). The initial phase of the project consisted of planning, constructing, and testing a new supply well at the District's Glen Park site, design of a blending facility at RBWTP, and construction of a pipeline from the well to the blending facility. The purpose of the Well Utilization Project was to supplement the District's surface water supply with groundwater, thereby reducing its dependence on imported surface supply and improving water supply reliability through alternative supply sources. The groundwater supply replaces a portion of the treated surface water and provides an emergency supply in the event of reductions of surface supplies due to drought or an outage of the RBWTP.

Not only does the program provide operational flexibility, it will ultimately serve to meet a portion of the District's future projected maximum day supply capacity. The program also benefits the District's rate payers by reducing surface water purchases from CCWD and deferring the cost of additional surface water treatment capacity that is offset by the groundwater supply.

The first phase of the Well Utilization Project was completed in 2006 with the commissioning of the Glen Park Well. An Environmental Impact Report (EIR) was prepared by the District to evaluate subsequent project phases, consisting of additional wells and supply pipelines, to the extent that groundwater quality is found to be favorable at prospective sites and increased pumping does not adversely affect local and regional groundwater resources. EIR milestones for

second and third phase well projects (i.e., a second well at the Stonecreek site and a possible third well at another location) included:

- Notice of Preparation of a Draft Environmental Impact Report, December 3, 2007.
- Notice of Preparation and Public Scoping Meeting, January 3, 2008.
- Notice of Determination, December 17, 2008.

The Stonecreek Well was constructed and tested in 2010 and the well station was brought on line in June 2011.

Groundwater Management Plan

In concert with implementation of a conjunctive use program under the Well Utilization Project, Diablo Water District prepared Groundwater Management Plan under AB3030. The GWMP was adopted in 2007 and identified the following Basin Management Objectives (BMOs) that serve the District's stated mission:

1) Understanding Local Groundwater Conditions
2) Preservation of Groundwater Quality
3) Avoid Impacts to Shallow Groundwater
4) Local Groundwater Monitoring and Coordination with Regional Monitoring

Associated with the above Basin Management Objectives, the GWMP incorporated various Plan Components including Maintaining Stable Groundwater Levels (2A), Management and Mitigation of Contaminated Groundwater (3B), and Long-Term Salinity Management (3C). In order to implement these components, the District established a groundwater monitoring program that included intensive groundwater level monitoring in the vicinity of its production wells at the Glen Park and Stonecreek sites using dedicated multi-completion monitoring wells constructed by the District as well as existing private wells (see **Figure 4-3**).

To accomplish the BMOs and associated components stated in the District's GWMP, it was recognized that certain gaps in hydrogeologic data existed, leading to a need to expand monitoring of groundwater levels and quality. The data gaps and monitoring expansion needs occur in portions of the aquifer system targeted in the District's conjunctive use program and in areas that serve as a source of groundwater supply for other cities, small communities (including some Disadvantaged Communities), and other entities in the region.

Periodic Reporting on Groundwater Conditions by Diablo Water District

Under the 2007 GWMP, the District will periodically prepare a report on groundwater conditions within its sphere of influence and the GWMP plan area. Groundwater conditions were presented in the District's EIR (Notice of Determination: December 17, 2008) and in a groundwater monitoring report in August 2011 (**Appendix 4-3**). The scope of the 2011 report consisted of the following topics:

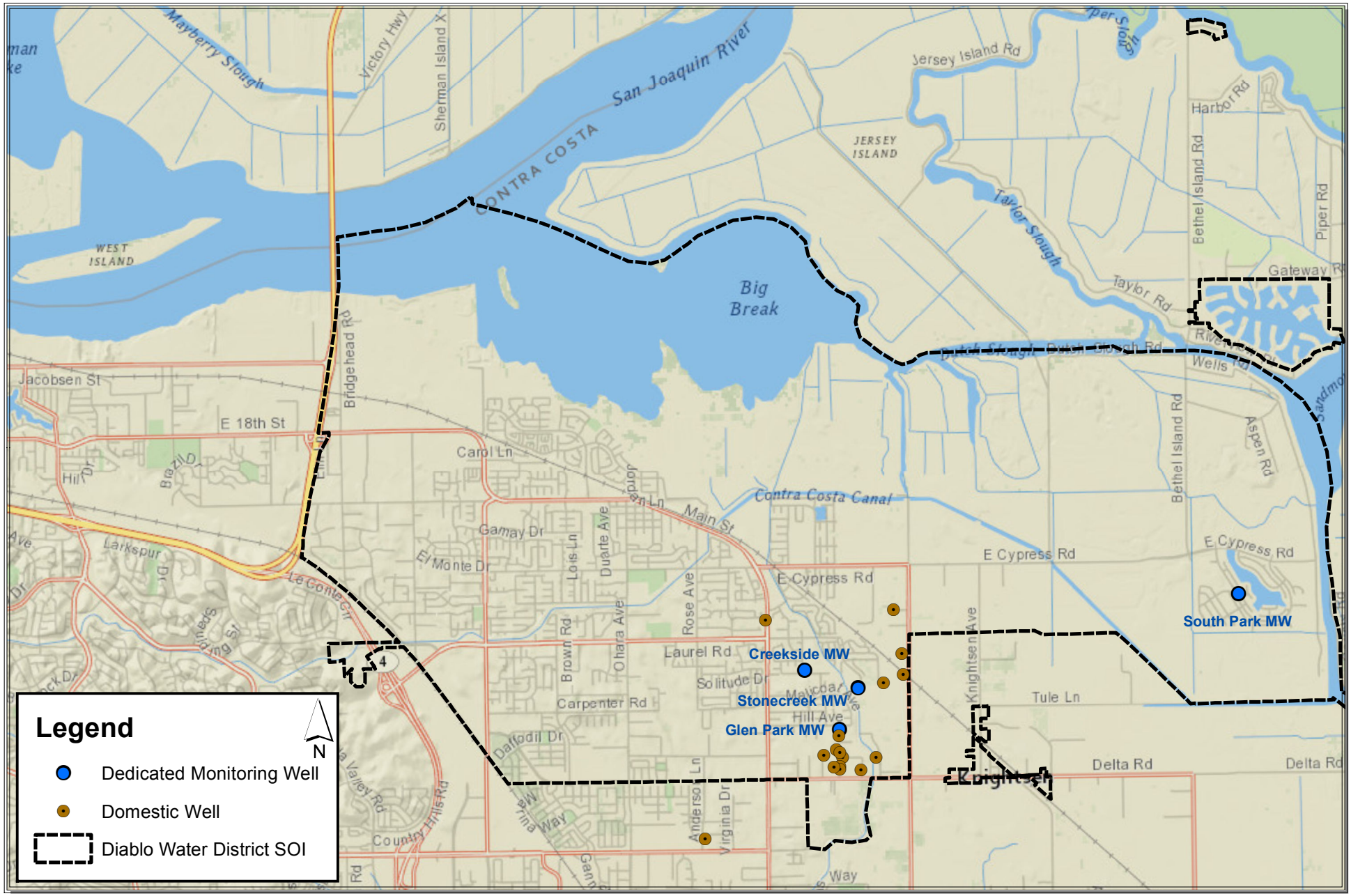

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Figure 4-3
Existing Monitoring Well Locations

- District groundwater and surface water use
- Precipitation
- Hydrographs for monitoring and production wells
- Contours of seasonal groundwater elevations
- Land subsidence
- Groundwater and surface water quality

The report, appended to this LGA application, depicts the District's existing monitoring network that will be expanded under the proposed project work.

CASGEM and Diablo Water District

In December 2010, the District applied to DWR to become the lead Monitoring Entity for the California Statewide Groundwater Elevation Monitoring (CASGEM) program on behalf of Diablo Water District, the City of Brentwood, the Town of Discovery Bay, and the East Contra Costa Irrigation District (ECCID). These entities designated wells appropriate for monitoring and reporting groundwater elevations under the CASGEM program. In anticipation of confirmation of DWR's acceptance of the District as the Monitoring Entity, the District identified the wells to be included in the monitoring program network and prepared a CASGEM Monitoring Plan (**Appendix 4-4**) as required by DWR. The plan contains the recommended components outlined by DWR, including a summary of the geology and groundwater resources in the District, Discovery Bay, Brentwood, and ECCID area. This Plan also identifies the planned CASGEM well network, the rationale for the selection of the wells, the field methods, and the monitoring schedule. The District has been submitting groundwater levels to the CASGEM program since January 2012 and is in final review to be formally designated as the Monitoring Entity for the area.

The proposed monitoring wells under this LGA grant application would be added to the CASGEM program by the District in its role as lead Monitoring Entity.

Overview of Hydrogeologic Setting

Diablo Water District overlies a portion of the San Joaquin Valley Groundwater Basin as designated by the California Department of Water Resources (DWR) Bulletin 118. The District is located in the northwestern portion of the Tracy Subbasin (5-22.15), which is one of sixteen subbasins in the San Joaquin Valley Groundwater Basin. The District's existing and prospective wells under the Well Utilization Project (discussed above) and this project are located in the Tracy Subbasin. Available information on the Tracy Subbasin summarized below is partly based on the information contained in DWR Bulletin 118, Update 2003 (DWR, 2003) and a more detailed basin description on the DWR web site (DWR, 2004).

Tracy Subbasin DWR Basin No. 5-22.15

The Tracy Subbasin includes the northwestern most portion of the San Joaquin Valley Groundwater Basin around the Sacramento-San Joaquin Delta and extending south into the central portion of the San Joaquin Valley. Overall, population density within the subbasin is relatively sparse, with the major cities being Tracy, Brentwood, and Oakley. Subbasin boundaries are defined by the Mokelumne and San Joaquin Rivers on the north; the San Joaquin River on the east; and the San Joaquin-Stanislaus County line on the south. The western subbasin boundary is defined by the contact between the unconsolidated sedimentary deposits and the rocks of the Diablo Range.

The only detailed hydrogeologic description of the portion of the groundwater basin in the east Contra Costa area was developed in a 1999 study by Luhdorff and Scalmanini Consulting Engineers (LSCE). In this study, several hundred well logs were reviewed and interpreted to delineate hydrogeologic features in the east Contra Costa County area. It was found that water resources in the region and within the District's sphere of influence are limited to alluvium materials from the land surface to approximately 500 feet. Below about 500 feet, brackish to saline water may be encountered. The characteristics of alluvium in the region vary according to depositional environment. Four depositional environments occur within the District area:

Fluvial Plain
Representative of the eastern portions of Diablo Water District and southward to Discovery Bay. The setting is probably similar to that which occurs in the present day area with northward flowing river channels, distributaries, and sloughs across floodplains of overbank areas. Deposits extend to depths of about 350 feet, below which occur largely fine-grained silts and clays.

Delta Islands
Representative of the northeastern portion of Diablo Water District and encompasses Bethel Island and vicinity. Sand and gravel beds may correlate to the Fluvial Plain, but net sand thicknesses and the number of beds appears to increase northward. Depositional environment interpreted as multiple stream channels meandering between islands. Channels would be active with through-flowing waters, then abandoned as new channels developed. Possibly slower stream flow and tidal fluctuations allowed thicker, fine-grained sand deposits to form.

Marginal Delta Dunes
Representative of the central to western portion of Diablo Water District and defined by numerous thin to thick sand beds. The depositional environment is a mixture of delta fluvial distributary channels and possibly eolian dune fields. Between Oakley and northern Brentwood, a surface deposit of rolling gentle hills of relic sand dunes occurs. These sand dunes are believed to have been generated by strong winds blowing sand off the delta margins. Some deeper sand beds across the Marginal Delta Dunes area may be older dune fields.

Alluvial Plain
Representative of greater Brentwood south of the Marginal Delta Dune and the City of Oakley, and west of the Fluvial Plain. The depositional environment consists of small streams draining eastward from the Coast Range foothills to the west. Flood flows of these streams spread out from the hills depositing fine-grained materials, possibly as mudflows with high sediment content. Stream flows deposited thicker sand and gravel beds that tended to stack upon each other causing the thicker bands of sand beds. The thicker stream deposited sand and gravel bands extend eastward until the sands either pinch out or have not been reached by wells. In the north, the stream deposits appear to reach into the Marginal Delta Dunes area, blending into the sand units that are present there.

Geologic cross sections were presented in the 1999 report showing the occurrence of the depositional features described above. The 2007 GWMP updated key cross sections from the 1999 study using data from the District's Well Utilization Project. The 1999 study and the 2007 GWMP indicated that conclusions about sustainable groundwater use were limited by well control and available groundwater monitoring.

With the successful implementation of a conjunctive use program and associated monitoring program, the District recognizes that its ability to ensure groundwater production within the safe yield of the basin is essential. The need to improve this aspect of its groundwater management activities is further underscored by concerns over climate change and recognized risks associated with surface water supplies in Northern California.

Overview of Groundwater Conditions

Wells monitored by the District exhibit distinguishing characteristics attributed to their depths of completion. These wells are categorized as shallow, deep, or a third subset of wells, labeled intermediate and defined as having characteristics that match both the shallow and deep wells. In hydrogeologic terms, the shallow wells are completed in shallow groundwater that is unconfined; the deep wells, such as those used for municipal supply, are confined by overlying fine-grained formations; and intermediate wells may be connected to both. A current understanding of groundwater conditions, as represented by water level monitoring, was discussed in the District's 2011 groundwater conditions report with the following conclusions:

Shallow Wells
Shallow domestic wells, most likely completed in aquifer units less than 100 feet in depth, exhibit stable conditions with little seasonal fluctuation throughout the period of record. There are no apparent pumping influences of pumping by District or other wells.

Deep Wells
Deep monitoring and supply wells, completed in aquifer units greater than 200 feet in depth, exhibit stable conditions with seasonal fluctuations throughout the period of record. There are no adverse trends in groundwater levels for any of these wells.

Intermediate Wells
Some supply wells, likely completed with hydraulic connection to both shallow and deep aquifer units, exhibit stable conditions. The seasonal fluctuations are greater than the shallow domestic wells described above. There are no adverse trends in groundwater levels for any of these wells.

Water quality data is much more limited in scope and does not permit interpretation of trends as with water levels. However, stable groundwater levels for all well categories described above indicates that water quality degradation due to the District's conjunctive use pumping is likely not a concern. However, two key issues have been identified regarding water quality and potential limitations on conjunctive use in the area. First, the District's Corporation Yard well exhibited an increase in dissolved mineral constituents, which is evident through test results on samples collected approximately 10 years apart. Second, Well M-26, which serves a small Disadvantaged Community of approximately 25 homes on Bethel Island and is operated by the District, produces groundwater with arsenic concentrations above the state MCL for drinking water. The implications of these observations is that water quality variations are not well understood in the area, even as groundwater levels are stable, and that water quality does not uniformly satisfy drinking water standards throughout the region. This LGA application seeks to construct facilities and acquire data to address these important issues.

Project Description

To meet the stated purposes to 1) improve characterization of hydrogeologic conditions and 2) expand the District's existing monitoring program, the proposed LGA grant project consists of the following tasks that are detailed in the workplan under Attachment 5:

Task 1 – Design and Installation of Monitoring Facilities
Task 1 consists of planning, design, and implementation of four (4) new monitoring well installations (**Figure 4-4**) that include test hole, or pilot hole, drilling; geophysical logging; and formation sampling. The four sites selected for this work were selected to address well control data gaps and to serve the need to more completely characterize the variations in water quality throughout the District's sphere of influence and its GWMP plan area:

***Bethel Island (M-26)*:** Well M-26 is the primary source of drinking water for approximately 25 residences in a small Disadvantaged Community on the northeast corner of Bethel Island. Groundwater produced by this well is of poor quality, primarily due to naturally high arsenic levels, typically ranging from 29 to 33 ug/L and above the MCL of 10 ug/L. For this reason, the California Department of Public Health (CDPH) has ordered treatment of the water, or that a new source of water be identified for this community. The prohibitively high cost of treatment, well replacement, or running a pipeline from another source represents a significant hardship to the community, limiting its ability to comply with the CDPH order. At this site it is proposed to drill a test hole and construct a monitoring well to investigate the occurrence and quality of groundwater in the deeper portion of the aquifer system. Through this effort, a new aquifer might be

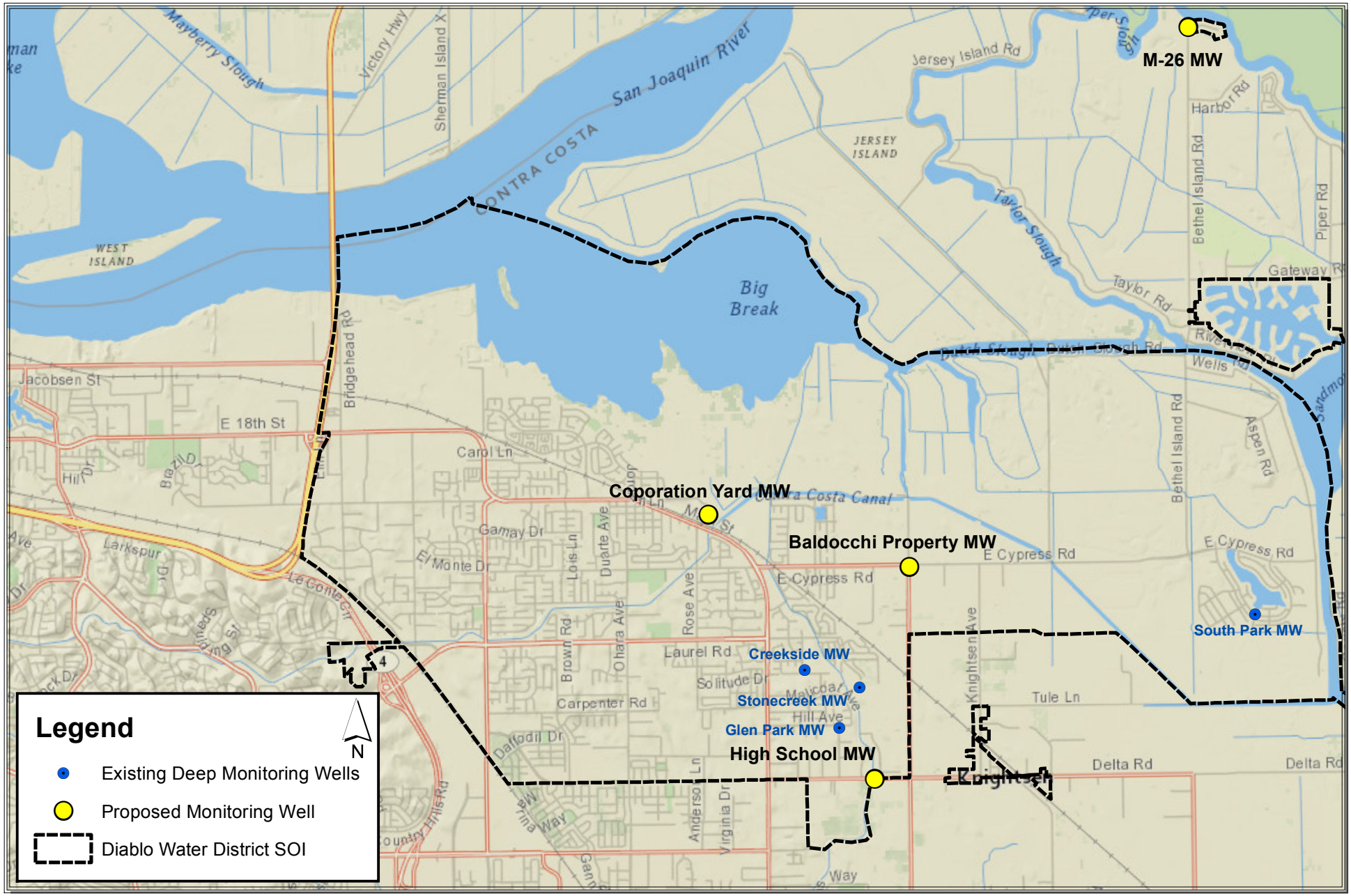

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Figure 4-4
Locations for Proposed Monitoring Facilities

identified for water supply replacement and the District would establish a new water level and quality monitoring station at the northeastern extent of the groundwater subbasin.

Diablo Water District Corporation Yard: The District's Corporation Yard is located in the northern portion of the District where limited lithologic and groundwater data is currently available. At this site, the District's Corporation Yard Well was decommissioned due to high and increasing dissolved mineral content. It is completed in shallow to intermediate aquifer units (see above description of the hydrogeologic setting) and has a total depth of 165 feet. The well currently serves as an emergency well for the District's water system.

The occurrence and source of groundwater degradation is unknown for this site, although evaporation ponds used historically by the adjacent wastewater plant may be a source of past salt loading. The conditions at the site pose a constraint on ultimate development of its conjunctive use program in the absence of an understanding of the degradation mechanisms for groundwater at the site. Through test hole drilling, geophysical logging, and monitoring well installation, the District seeks to characterize the conditions that affect groundwater quality at this location and vicinity.

Future High School Site: This site is located on the boundary between Diablo Water District and the City of Brentwood. In the 2011 groundwater conditions report, it was noted that TDS and chloride in City of Brentwood wells located southwest of the District's production wells have increased. If these observations indicate a trend, they may ultimately limit and adversely impact the District's conjunctive use project. A factor that will be investigated at this site is the infiltration of treated wastewater released to Marsh Creek by the City of Brentwood upstream of the District's wells. The proposed monitoring facility would include a shallow piezometer completed in the water table aquifer that is hydraulically connected with the creek.

Baldocchi Property: A significant gap in available hydrogeologic data exists in the area between the District's Stonecreek production well and a standby production well at the South Park site. Filling this data gap will enable the District to more effectively monitor the primary production aquifer tapped for its conjunctive use program and therefore aid the District's ability to make informed management decisions. Geologically, this area represents the transition between two depositional environments; the eolian/alluvial Marginal Delta Dunes and fluvial Delta Islands environments (see above discussion of hydrogeologic setting). In this area, water quality appears to transition from favorable to less favorable characteristics. Groundwater quality at the District's Glen Park and Stonecreek production wells is favorable for municipal supply purposes, while the South Park standby well exhibits manganese concentrations that exceed the state drinking water standard for this constituent.

Task 2 – Design and Installation of Monitoring Equipment

A total of nine (9) transducers will be purchased for installation in each new multiple-completion monitoring well piezometer to provide water levels for shallow, intermediate, and deep aquifers as characterized in previous studies. Transducers would also be installed in the existing M-26 and Corporation Yard wells. Transducers purchased for the Corporation Yard

well and shallow monitoring well at the High School site would have the added capability of measuring specific conductance as monitoring of those sites has the added objective of identifying degradation mechanisms of groundwater quality, which would be reflected through this parameter.

Task 3 – Groundwater Level and Quality Monitoring

Water level and water quality monitoring will be implemented by the District in the new monitoring facilities. Manual water level readings will be made to provide quality assurance for the continuous readings provided by transducers with initial readings conducted at the time of transducer installation. Subsequent manual measurements would be made monthly to quarterly as part of the District's existing groundwater monitoring program. Transducers will be programmed to record between 1 and 6 water level measurements daily (i.e., 4 to 24 hour frequencies). Data will be downloaded after one month and then quarterly during the first year following installation. Subsequent downloads will be at least semi-annual.

Groundwater quality sampling will be performed at the time of the monitoring well installations. Subsequently, testing will be performed according to the detailed plan presented in Attachment 5 using a California/EPA certified laboratory.

Task 4 – Data Management and Reporting

An existing District database will be expanded to manage new data under this proposed LGA grant project. The database will include all manual and automated water level data along with water quality, construction, and survey data for all wells in the monitoring program. Queries will be prepared to generate water level hydrographs and tables from the database.

A report on groundwater conditions will document construction activities, including as-built drawings of new wells. Recommended procedures for retrieving data, performing manual measurements, QA/QC of data, reporting, and data transfer will be integrated into the District's groundwater monitoring reporting. LGA grant funds will not be used for the preparation of the reports.

Under this task, the District will revise its existing CASGEM Monitoring Plan (LSCE, 2012) and CASGEM reporting to include the new monitoring facilities and water level data. This work will be performed with District funds.